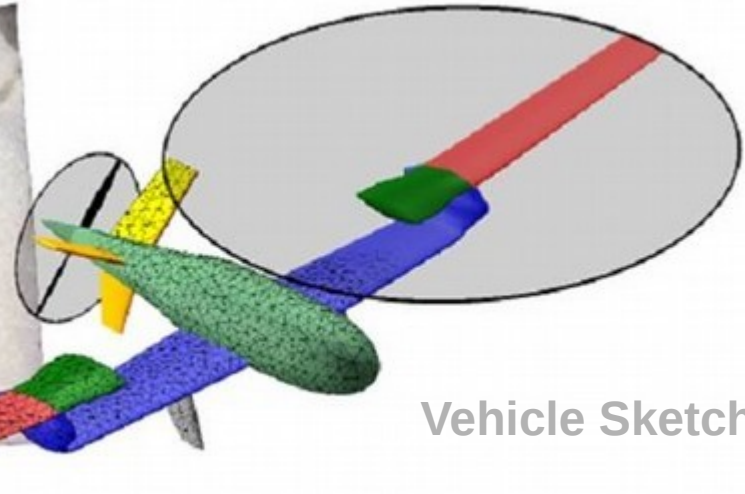


OPENVSP

Workshop 2016



Vehicle Sketch Pad

Aircraft Design Framework with VSP in the Loop

Alessandro Davi
Roberto Gil Annes



August 25th, 2016

Summary

- x Introduction
- x Airplane conceptual design
- x Design framework
- x Wrap up (overall present status)
- x Future

Introduction

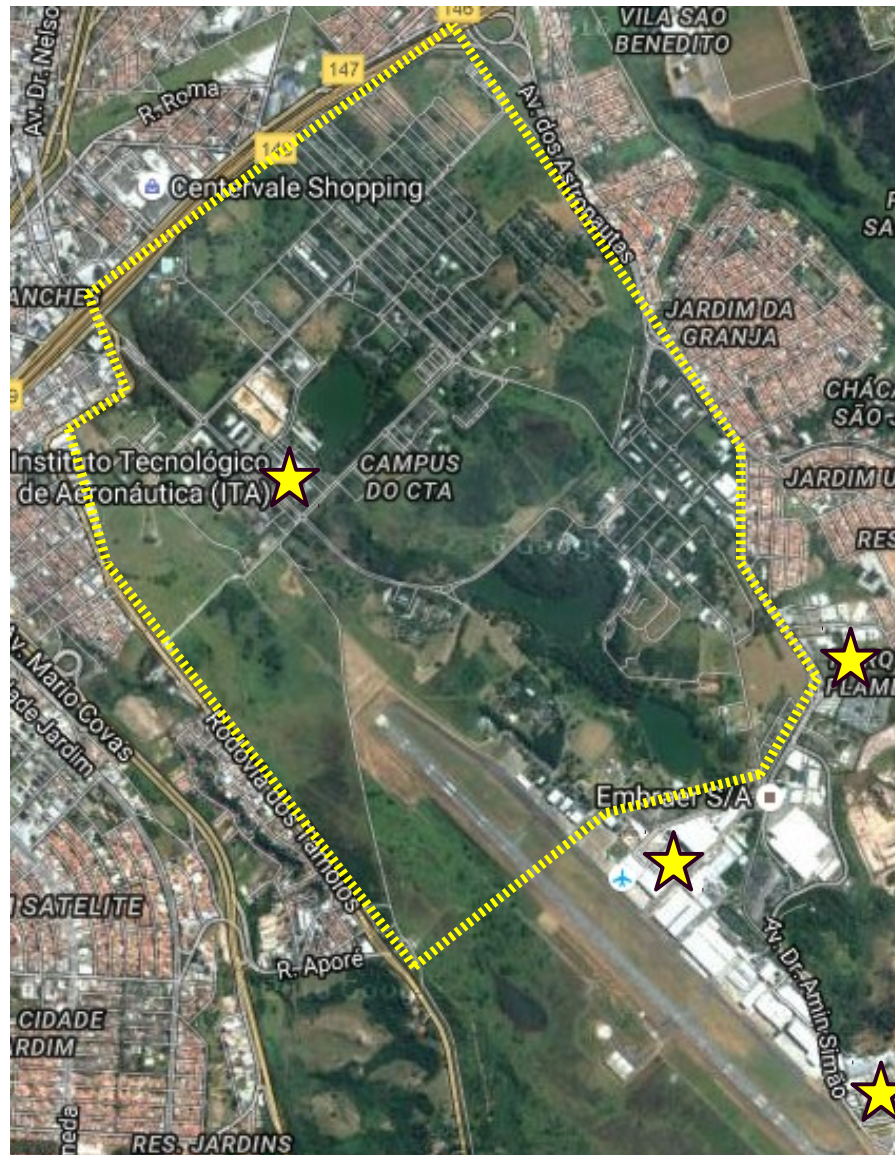


Technological Institute of Aeronautics

- x Public college of engineering under governance of the Brazilian Defense Ministry
- x Idea conceived in 1943 by Casimiro Montenegro Filho
- x 1st graduation in 1950
- x Team of professors spanned 16 different nationalities

Introduction

CTA
Aerospace
Technical Center
- 5.4 sq miles -



Nearby aerospace industries

MECTRON

EMBRAER
Main plant

AVIBRAS
Plant I

Introduction - ITA's notable children


1961 -  **AVIBRAS**



1969 -  **EMBRAER**



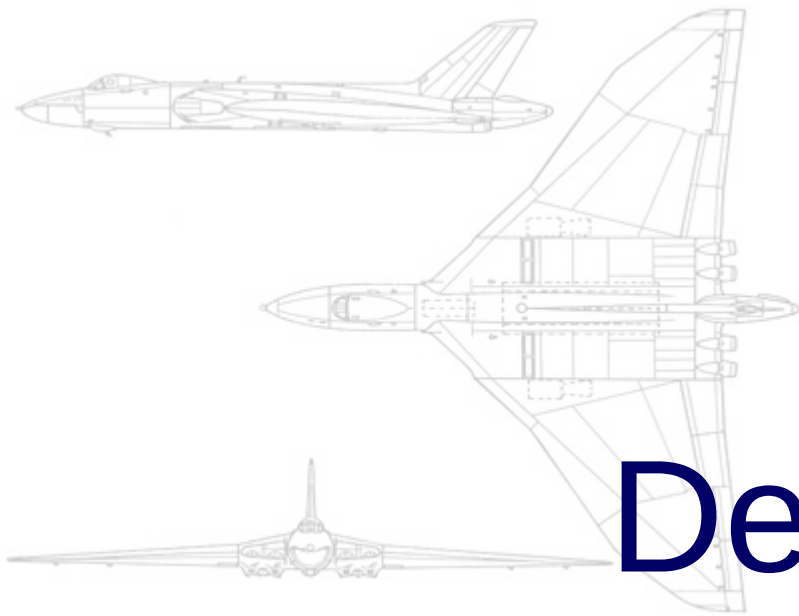
Introduction - ITA's notable children

1991 -  **Mectron**



2004 -





Design talk



** Illustrative only - not in the same scale*

Airplane conceptual design

What is needed ?

- x Well balanced set of requirements
- x Explore large design spaces
- x To make lots of assumptions
- x Ability to iterate fast

Airplane conceptual design

Iterate involves ...

- x Fast 3D drawing and exporting the essentials of the geometry in a format that is amenable to use by the analysis tools
- x Run analyses in a wide range of fields of knowledge
- x Perform trade studies

Airplane conceptual design

In the end of the conceptual phase

NASA, 2008



Lockheed Martin, 2010

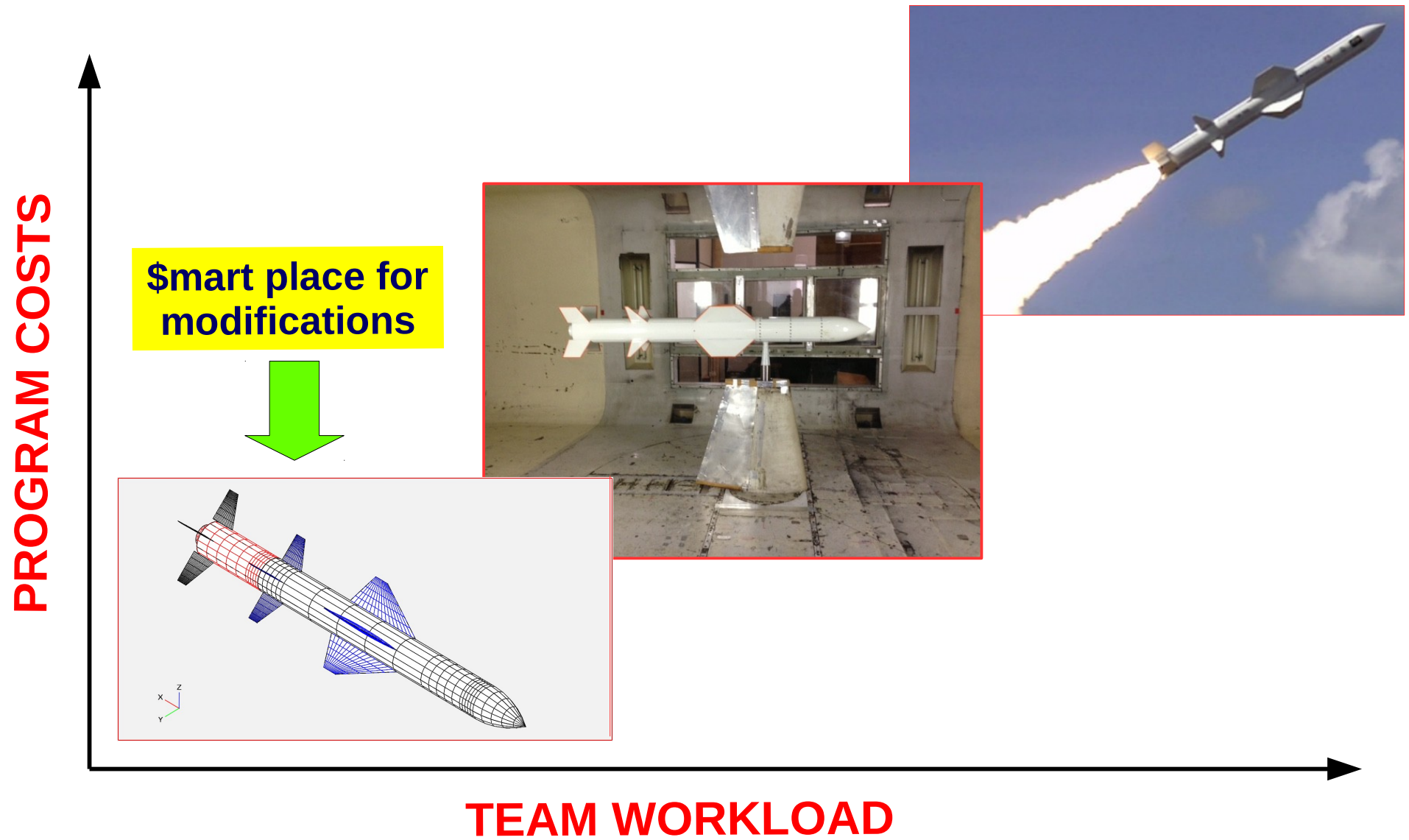


NASA, 2015



- x We have some alternative concepts
- x One is selected as baseline to go forward with
- x Decision on the “winner” is not strictly technical

Airplane conceptual design



Airplane conceptual design

What's the correct balance ?

**Simple
methods**

**Higher fidelity
methods**



Design framework

A flexible framework yields the highest payoff

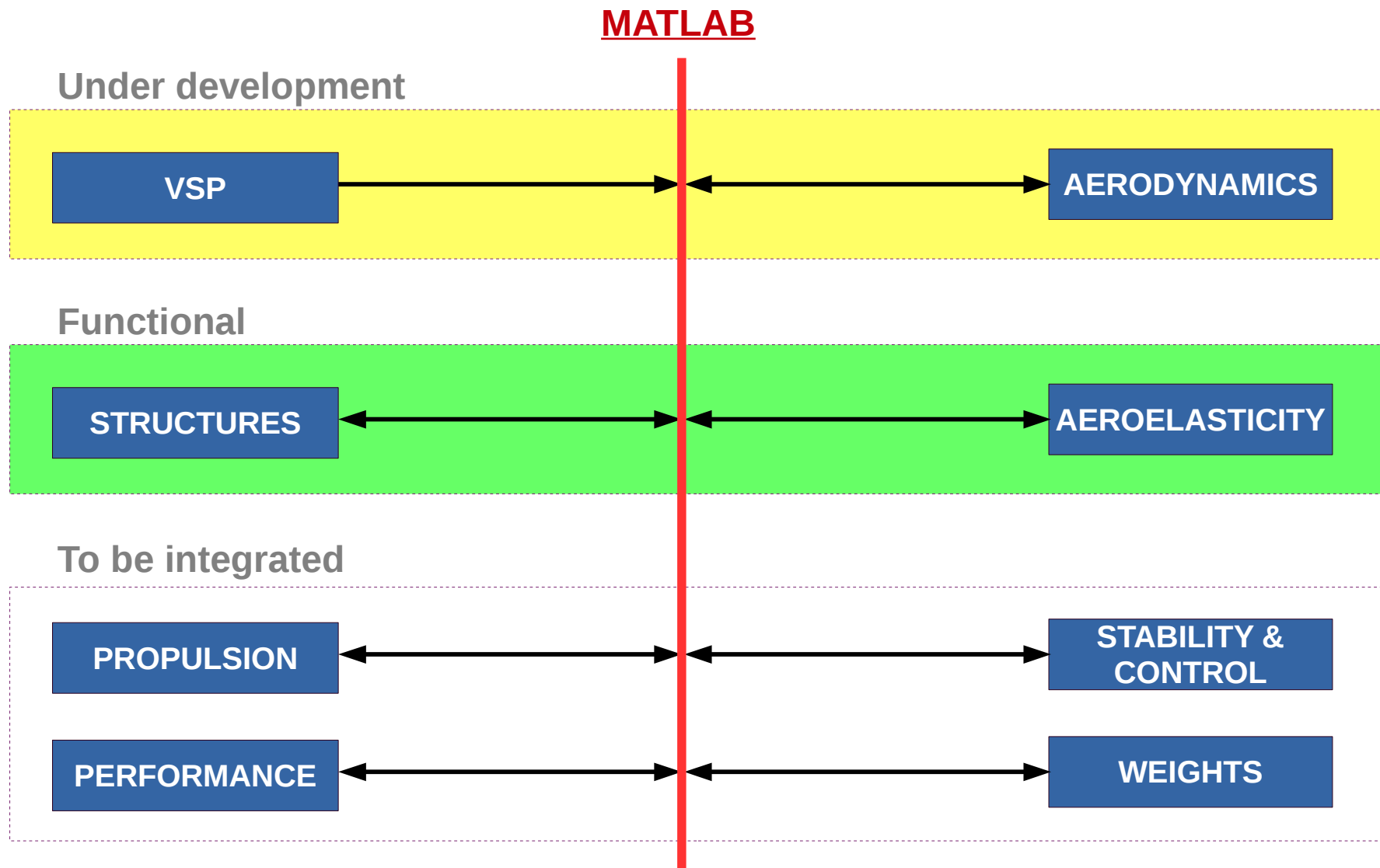
- x Methods vary widely depending on the nature of the design
- x Academic and industry needs may be different
- x Every engineer / company has its own preferences

Design framework

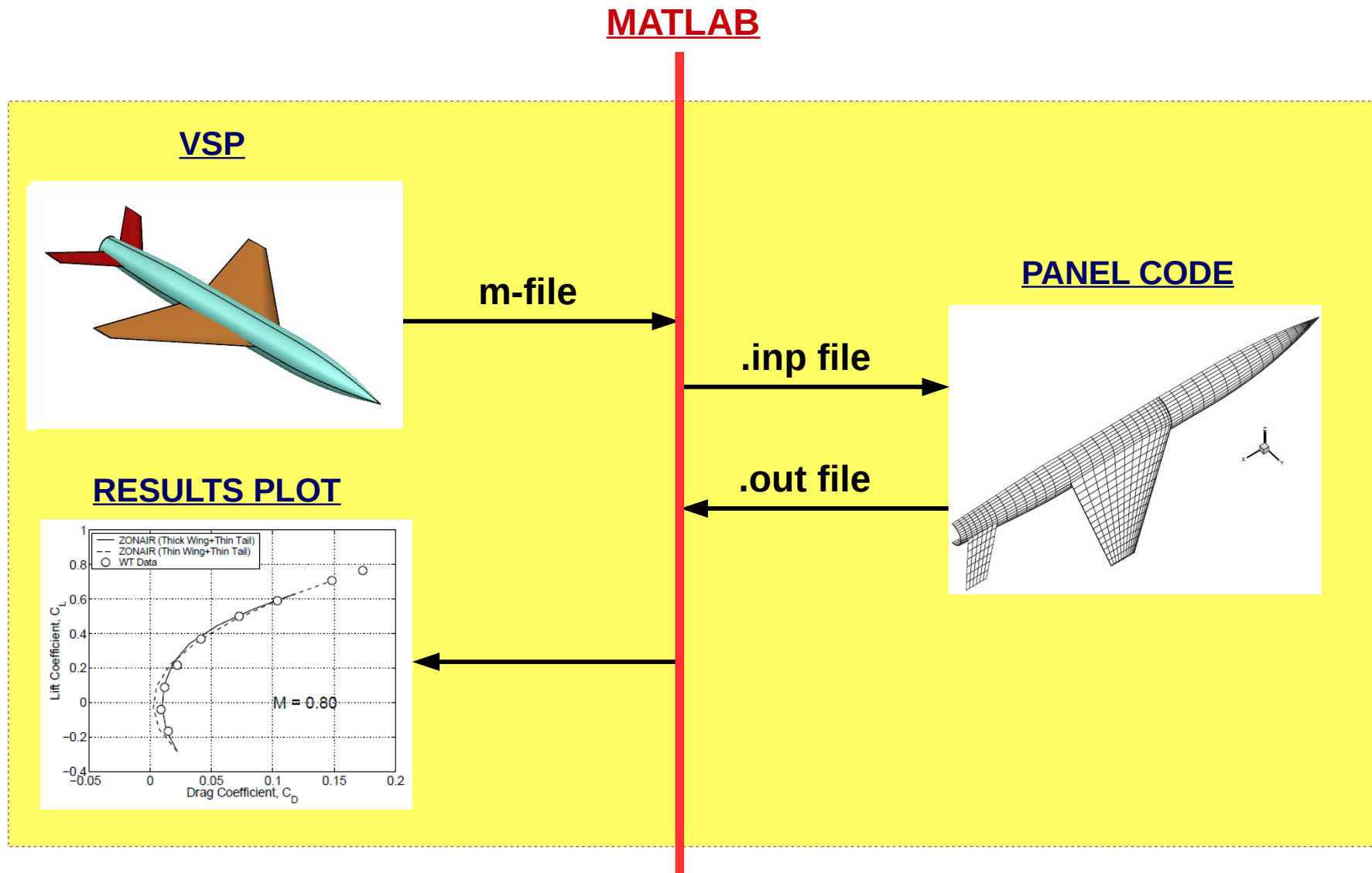
High level requirements for ITA's framework

- ✗ Modular architecture with Matlab as integration backbone and OpenVSP as the CAD module
- ✗ Serve both academic and industry needs
- ✗ Must handle unconventional configurations
- ✗ Hands off meshing

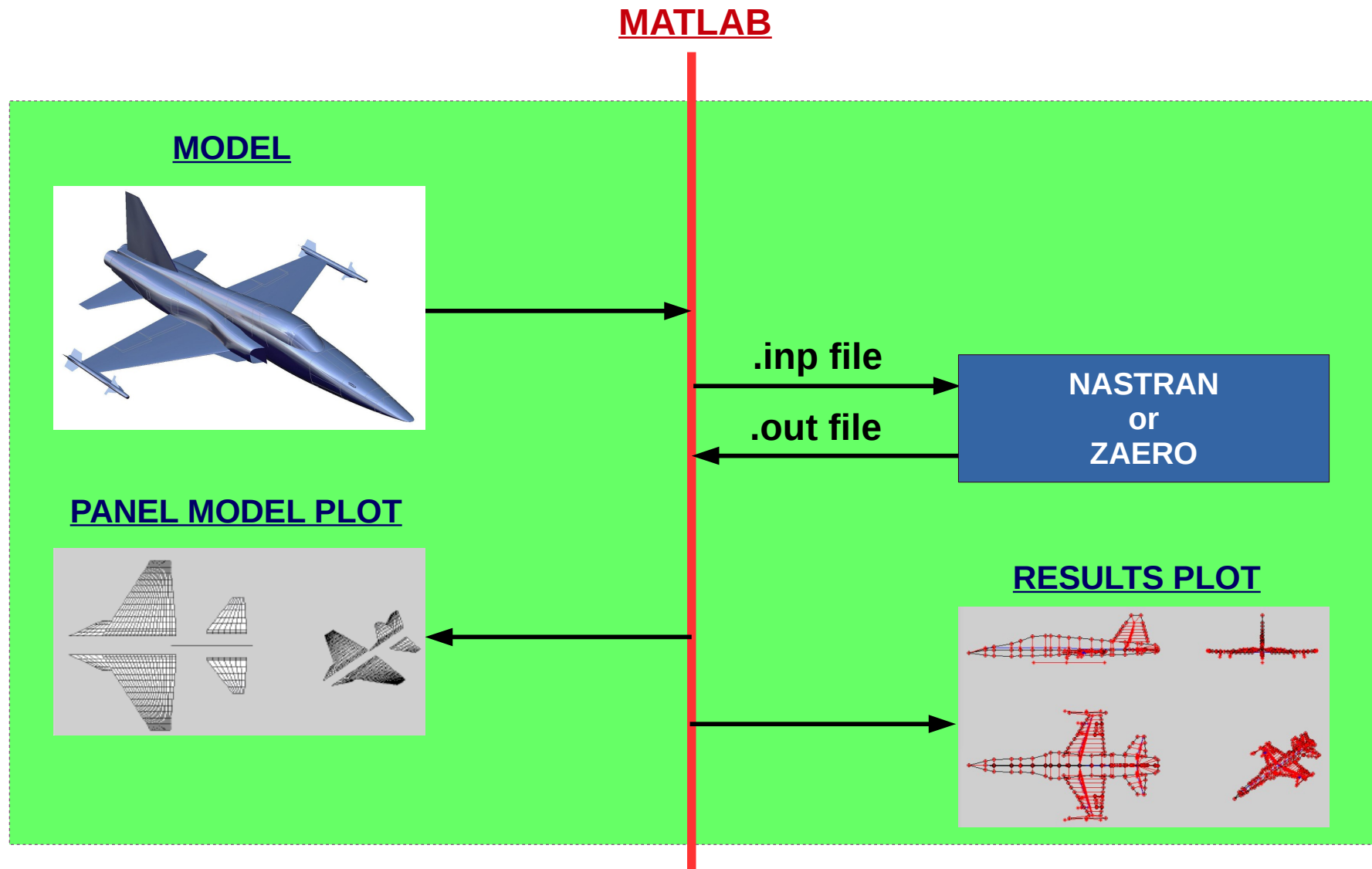
Design framework



Design framework - Aerodynamics



Design framework - Aeroelasticity



Wrap up

Current framework biased towards airlines

- x The new framework covers the need for a more embracing tool
- x OpenVSP fills the gap for CAD module
- x Development being done by post grad students
- x High maintenance costs (software licenses)

Future

ITA's vision for the design framework

- x Launch VSP and the framework in the graduation program
- x Close the loop to run optimization
- x Gradual movement towards free software
- x Engage people on full-time dedication

Thank you !